Posters to be presented at the
CONFERENCE IN HONOR OF MURRAY ROSENBLATT
UC San Diego, October 21-23, 2016.

Presenter: Shahrouz Alimohammadi, PhD student, Department of Mechanical and Aerospace Engineering, UCSD, salimoha@eng.ucsd.edu
Title: Uncertainty Quantification of the time averaging of a Statistics Computed from Numerical Simulation of Turbulent Flow
Abstract: Rigorous assessment of uncertainty is crucial to the utility of numerical simulation of Turbulent flow. The Turbulent flows are often stationary and ergodic, after some initial transient time. Therefore, the time averaged of a quantity (velocity, TKE (turbulence kinetic energy), total drag, etc.) converges to a constant as the averaging interval increases. The infinite-time-average statistic is of particular interest in many problems, such as aerodynamic shape optimization. Since taking an average over an infinite time horizon is not possible, some finite-time approximation of the infinite-time-average statistic of interest is used in practice. In this work, we develop a framework to first automatically deletes the transient part of a turbulence simulation; and then, quantifies precisely the uncertainty of such a finite-time-average approximation of an infinite-time-average statistic of a stationary and ergodic process. This framework then is evaluated using synthetic data and the application-oriented data derived from Navier-Stokes simulation result.

Presenter: Shuyang Bai, Assistant Professor, Department of Statistics, University of Georgia bsy9142@gmail.com
Title: Self-normalized resampling of long-memory time series
Abstract: Statistical inference of long-memory time series faces two challenges due to the special behavior of the sample sum 1) a non-standard fluctuation rate which is typically unknown 2) a family of non-Gaussian scaling limits arise and it is difficult to determine which one is involved statistically. We introduce a procedure which combines two strategies: self-normalization and subsampling. Such a combination successfully bypasses the aforementioned challenges.

Presenter: Srinjoy Das, PhD student, Department of Electrical and Computer Engineering, UCSD, srinjoyd@gmail.com
Title: Predictive inference for locally stationary time series
Abstract: A large class of time-series encountered in real-life which include examples such as key economic data and certain weather pattern measurements have a slowly changing stochastic structure where it is possible to analyze the series by assuming stationarity over short time windows. For such cases of locally stationary time series (LSTS) the Model-Free (MF) Prediction Principle developed by Politis (2013) can be used for predictive inference. The MF principle permits analysis of such series in very general cases which may include a trend and time-varying mean, variance, higher-order moments or nonstationarity in the mth order marginal distribution. Based on various nonstationarity properties of such LSTS several one-step ahead point prediction and prediction interval generation methods are developed and their performance compared using finite sample simulations.

Presenter: Mamikon Ginovyan, Professor, Department of Mathematics and Statistics, Boston University, ginovyan@bu.edu
Title: Robustness to small trends of estimation for continuous-time time series models with memory
Abstract: In time series analysis, much of statistical inferences about unknown spectral parameters or spectral functionals is concerned with the discrete-time short memory stationary models, in which case it is assumed that the model has a constant mean. In this talk we discuss a question involving robustness of inferences, carried out on a continuous-time models, possibly exhibiting long memory, contaminated by a small deterministic trend. We show that under some conditions on the underlying stationary process and the trend, the asymptotic properties of estimators for unknown spectral parameters and spectral functionals, known for a stationary model, remain valid for a contaminated by a small deterministic trend non-stationary model, that is, the estimating procedure is robust against this kind of departure from the stationarity.

Presenter: Mahtab Hajebi, Visiting PhD student, Department of Mathematics, Southern Illinois University at Carbondale, hajebi25@yahoo.com
Title: A Semiparametric Estimation for Vector Regression Functions in Nonlinear Vector Autoregressive Time Series Models
Abstract: In this presentation, a semiparametric method is proposed to estimate vector regression function in nonlinear vector autoregressive time series model. A combination of parametric and nonparametric estimation method is proposed to estimate the nonlinear vector function. Multivariate Taylor series expansion is used to construct parametric structure for the link function, then the initial parametric approximation is adjusted by a nonparametric factor. That is, the unknown parameters are estimated through the least squares method, then the obtained vector regression function is adjusted by a nonparametric diagonal matrix; where a nonparametric kernel estimator is used to estimate the proposed adjustment matrix. Some asymptotic behaviors of the proposed estimators are established, and the results of our simulation study for the semiparametric method are presented. Furthermore, an empirical example is proposed to illustrate the proposed method.

Presenter: Jue Hou, PhD student, Department of Mathematics, UCSD, j7hou@ucsd.edu
Title: A Nonparametric Maximum Likelihood Approach for Partially Observed Cured Data with Left Truncation and Right-Censoring
Abstract: The analysis of spontaneous abortion (SAB) data collected via observational studies in pregnancy demands modification to the traditional cure-rate setting (Farewell, 1982). Such data has a observable 'cured' portion as the survivors at the well-defined finite upper bound of failure time. The data is also subject to left truncate in addition to right-censoring because women may enter or withdraw from a study any time during their pregnancy. Left truncation in particular causes unique bias in the presence of a cured portion. In our paper, we extend the classical cure rate model to accommodate such data by proposing a conditional nonparametric maximum likelihood approach (NPMLE). To tackle the computational challenge brought by left truncation, we develop a rapid algorithm

for NPMLE inspired by the "ghost copy" EM from Qin et al (2011), using existing glm and coxph solvers. A closed form variance estimator for EM is derived following Louis (1982). Under weaker assumptions, we prove the consistency of the resulting estimator involving an unbounded baseline hazard. We then show the asymptotic normality with stronger assumptions. Simulation results are presented to illustrate finite sample performance. We present the analysis of the motivating SAB study to illustrate the power of addressing both occurrence and timing of failure times in practice.

Presenter: James Morton, PhD student, Department of Computer Science, UCSD, jmorton@eng.ucsd.edu
Title: Probabilities to balances—another perspective
Abstract: Probability theory is the hallmark of modern science and mathematics. However, probabilities themselves are not convenient quantities to deal with, and can lead to extremely unintuitive consequences, particularly in analyzing omics datasets common in the biological sciences. In microbiome studies one cannot infer growth or decline of any species from relative abundance data, since the growth of one species could also be explained by the decline of the remaining species. We motivate to deviate away from the standard of dealing with probabilities, and instead focusing on balances introduced from Aitchison geometry. This framework not provides a mathematically rigorous perspective, but has been enabled leaps in resolving multiple studies. From understanding the role of anaerobes in microbial communities in the lungs of Cystic Fibrosis patients, to understanding microbial niche differentiation on a global scale in the Earth Microbiome Project, to identifying differences between folivore and non-folivore diets in monkeys.

Presenter: Seyed Yaser Samadi, Assistant Professor, Department of Mathematics, Southern Illinois University at Carbondale, ysamadi@siu.edu
Title: Matrix Autoregressive Models
Abstract: Many data sets in many scientific areas deal with multiple sets of multivariate time series. While single univariate and single vector time series are well developed in the literature, multiple sets of multivariate time series have not yet been studied. Therefore, a class of matrix time series models is introduced for dealing with the situation where there are multiple sets of multivariate time series data. Explicit expressions for a matrix autoregressive model of order p along with its cross-utocorrelation functions are derived. Parameters of the proposed matrix time series model are estimated by ordinary and generalized least square method, maximum likelihood estimation, and Bayesian methods.

Presenter: Knut Solna, Professor, Department of Mathematics, UC Irvine, ksolna@math.uci.edu
Title: Asymptotics for long range stochastic volatility
Abstract: Empirical studies show that the volatility of financial price time series may exhibit correlations that decay as a fractional power of the time offset. We present a rigorous analysis for the case when the stationary stochastic volatility model is constructed in terms of a fractional Ornstein Uhlenbeck process to have such correlations. It is shown how the associated implied volatility has a term structure that is a function of maturity to a fractional power.

Presenter: Jing Zhang, PhD student, Department of Statistics, Columbia University, jz2481@columbia.edu
Title: Semiparametric estimation for non-Gaussian non-minimum phase ARMA models
Abstract: We consider inference for the parameters of ARMA models which are possibly non-causal/non-invertible and driven by a non-Gaussian distribution. For noncausal and/or noninvertible cases, the observations can depend on both the past and future shocks in the system. Many of the existing estimation procedures adopt quasi likelihood methods by assuming a non-Gaussian noise with distribution fully known up to to a scalar parameter. To relax such distributional restrictions, we borrow ideas from nonparametric density estimation and propose a semiparametric maximum likelihood estimation procedure, in which the noise distribution is projected onto to the space of log-concave measures. We show the maximum likelihood estimators of the conditional likelihood function are consistent. In fact, the MLE is robust to the misspecification of log-concavity in cases where the true density f_0 is close to it's log-concave projection. The asymptotic normality of the maximum likelihood estimators is established for AR models via constructing the least favorable submodels. Notably, the MLE achieves semiparametric efficiency.

Presenter: Tingyi Zhu, PhD student, Department of Mathematics, UCSD, t8zhu@ucsd.edu
Title: Kernel Estimation of Nonparametric Functional Autoregression
Abstract: We study a nonparametric functional autoregression model of order one (FAR1). In the poster, we define a conventional kernel estimator of the autoregressive operator and develop its asymptotic theory under a strong mixing condition on the sample. A component-wise bootstrap procedure is proposed and its asymptotic validity is proved. Some simulation studies are presented to illustrate the theoretical advances.